Can cockpit automation cause pilots to lose critical thinking skills? Research says yes

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In the wake of recent airline crashes, major news networks have aired concerns about pilots' ability to accurately fly "by hand" when the airplane's cockpit automation systems fail. Although many of these concerns have centered on manual skills such as operating the airplane's controls, new human factors/ergonomics research suggests that pilots' thinking skills, such as navigating, remaining aware of the status of the flight, and diagnosing troublesome situations, are most vulnerable in today's automated cockpits. In a new study published in *Human Factors*, researchers studied how the prolonged use of cockpit automation negatively impacts pilots' ability to remember how to perform these key tasks.

"There is widespread concern among pilots and air carriers that as the presence of automation increases in the airline cockpit, pilots are losing

the skills they still need to fly the airplane the 'old-fashioned way' when the computers crash," said Steve Casner, coauthor of "The Retention of Manual Flying Skills in the Automated Cockpit" and research psychologist at NASA's Ames Research Center.

Casner and coauthors Richard Geven, Matthias Recker, and Jonathan Schooler studied 16 experienced pilots as they flew routine and nonroutine flight scenarios in a Boeing 747-100 simulator. Levels of automation available to the pilots were varied as the researchers graded pilots' performance. The pilots also reported what they were thinking about as they flew.

Results indicated that pilots' instrument-scanning and "stick-and-rudder" skills remained reasonably intact despite prolonged periods of disuse. More significantly, however, the study found that pilots often struggled with maintaining awareness of the airplane's position when the GPS and map display were disabled, or with troubleshooting problems when the automated systems were not available to provide hints. Furthermore, pilots who relied more heavily on the computers to handle these tasks and who allowed their thoughts to drift during flight were more likely to suffer the effects of rusty cognitive skills.

"Our results suggest that we might be a bit less concerned about things that pilots do 'by hand' in the cockpit and a bit more concerned about those things that they do 'by mind,'" said Casner. "Pilots' ability to remain mindful and engaged as they now watch computers do most of the flying may be a key challenge to keeping their cognitive skills fresh."

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